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Science and technology for development

Report of the Secretary-General

Summary

The present report, prepared by the United Nations Conference on Trade and Development in response to General Assembly resolution 68/220, provides information on the implementation of the resolution, particularly through the work of the Commission on Science and Technology for Development, the United Nations Conference on Trade and Development and other relevant United Nations organizations. The report highlights findings from policy discussions and research on science, technology and innovation as an enabler of sustainable development; lessons learned and recommendations from the work done to assist developing countries in their efforts to integrate science, technology and innovation policies into national development strategies and strengthen their national innovation systems; and the review of progress made in implementing the outcomes of the World Summit on the Information Society.

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I. Introduction

1. The present report responds to General Assembly resolution 68/220, in which the Assembly requested the Secretary-General to submit at its seventieth session a report on the implementation of the resolution and recommendations for future follow-up, including lessons learned in integrating science, technology and innovation policies into national development strategies.

2. In its resolution 68/220, adopted 20 December 2013, the General Assembly recognized the vital role that science, technology and innovation, including information and communications technology (ICT), can play in facilitating efforts to address global challenges and achieve internationally agreed development goals. The Assembly expressed concern that the promise of science, technology and innovation remains unfulfilled for the majority of the poor; many developing countries lack affordable access to ICT and face serious challenges in building their national science, technology and innovation bases.

3. The General Assembly requested the United Nations Conference on Trade and Development (UNCTAD) to continue its science, technology and innovation policy reviews. It asked the Commission on Science and Technology for Development to address the special needs of developing countries in areas such as agriculture, rural development, environmental management and ICT, and to provide a forum to assist in the follow-up to the outcomes of the World Summit on the Information Society.

4. The General Assembly reaffirmed its commitment to leverage science, technology and innovation for development, and called on Member States, United Nations agencies and the international community, as appropriate, to give science, technology and innovation due consideration in elaborating the post-2015 development agenda; carry out empirical research on innovation and development, including national innovation systems; and assist developing countries in integrating science, technology and innovation into development strategies and enhance their science, technology and innovation capacities.

5. The General Assembly reiterated its call for continued collaboration between United Nations entities and other international organizations, civil society and the private sector in implementing the outcomes of the World Summit with a view to putting the potential of information and communications technologies at the service of development through policy research on the digital divide and on new challenges of the information society, as well as technical assistance activities, involving multi-stakeholder partnerships.

6. Governments were urged to mainstream a gender perspective in legislation, policies and programmes, and to strengthen investment in environmentally sound technologies, with support from the international community.

7. Scientific organizations and research institutions dealing with science, technology and innovation were encouraged to develop strategic alliances with governments, the public and private sectors, universities, laboratories and civil society to further expand their fellowship and training programmes.

8. The international community was encouraged to continue to facilitate an adequate diffusion of scientific and technical knowledge and transfer of, access to and acquisition of technology. The General Assembly also called upon the development community to initiate, implement and support measures to improve the

level of participation of scientists and engineers from developing countries in international collaborative research and science, technology and innovation projects.

9. In response to the resolution, the present report will highlight findings from policy discussions and research on science, technology and innovation as an enabler of sustainable development; lessons learned and recommendations from the work done to assist developing countries in their efforts to integrate science, technology and innovation policies into national development strategies and strengthen their science, technology and innovation capacities; and the review of progress made in implementing outcomes of the World Summit, including research and policy discussions on the digital divide. It concludes by providing updates on some of the initiatives to strengthen science-policy advice; integrate science, technology and innovation into financing for development; and enhance global science, technology and innovation support mechanisms.

II. Harnessing science, technology and innovation for sustainable development

10. The Commission on Science and Technology for Development devoted its 2014 and 2015 sessions to examining the role of science, technology and innovation in the transition from the Millennium Development Goals to the sustainable development goals.[1] The aim was to assess how science, technology and innovation contributed to achieving the Millennium Development Goals and, learning from that experience, provide policy lessons for the role of science, technology and innovation within the post-2015 development agenda.

A. Transition from Millennium Development Goals to sustainable development goals

11. Drawing on national and international experiences, the Commission analysed the role of science, technology and innovation in the implementation of the Millennium Development Goals. The following issues were examined in particular: science, technology and innovation and the technological divide; ICT and the digital divide; science, technology and innovation and social objectives, such as sustainable urbanization, agriculture and energy; science, technology and innovation for capacity-building, particularly through education and research; and the impact of new technologies on development.[2]

12. The Commission's work demonstrated that science, technology and innovation had a critical role to play in the progress towards the Millennium Development Goals. The basic needs of people, such as food, water, sanitation, education, health,

[1] The four priority themes from the past two sessions were science, technology and innovation for the post-2015 development agenda, ICT for inclusive social and economic development, strategic foresight for the post-2015 development agenda and digital development. The 2015 session also included a ministerial round table on the role of science, technology and innovation in managing the transition from the Millennium Development Goals to the sustainable development goals.

[2] See E/CN.16/2014/2 for a detailed mapping of Commission priority themes and their linkages with the Millennium Development Goals.

housing and energy, all have technological elements and require complex combinations of household, community, public and private action.

13. While there have been success stories in capitalizing on the potential of science, technology and innovation for the implementation of the Millennium Development Goals, that potential was not fully utilized in several sectors and in many countries. The Commission underlined that the key lesson from that varied experience is that science, technology and innovation policies need to be thoroughly integrated into national development plans and strategies.

14. The lack of national capacity for science, technology and innovation hindered the progress towards some of the Millennium Development Goals, especially in the least developed countries. That included a lack of capacity to formulate coherent science, technology and innovation policies and integrate them into development plans; a lack of human resources in science, technology, engineering and mathematics; and a lack of absorptive capacity of local firms and their ability to innovate.

15. The Commission found that policies related to science, technology and innovation are often disjointed, and that has resulted in policy ineffectiveness. Policies formulated in the ministries and agencies dealing with issues related to science, technology and innovation are often disconnected from the policies formulated in the ministries and agencies dealing with health and environment, for example. Similarly, policies related to entrepreneurship are often not in line with those dealing with innovation.

16. The work of the Commission highlights that the impact of science, technology and innovation on development must be understood within the context of a socio-technical system, one in which humans and technologies work together to produce outcomes to effectively respond to societal challenges. In that context, the Commission noted the importance of multi-stakeholder and community-based initiatives that utilize local knowledge, stimulate grass-roots entrepreneurship and harness existing technologies to solve local problems.[3]

17. Those findings underline the importance of science, technology and innovation for development and provide valuable lessons for work beyond 2015. First, the role of science, technology and innovation as an enabler of the post-2015 development agenda needs to be strongly articulated. The development community needs to not only recognize the concept of science, technology and innovation as a cross-cutting theme but also define how it will contribute to achieving the sustainable development goals. Second, national science, technology and innovation capacity-building needs to be a priority. That includes strengthening national innovation systems and the institutions that deal with science, technology and innovation and their ability to integrate science, technology and innovation policies into national development plans. That requires, inter alia, improving policy coherence and coordination related to science, technology and innovation; strengthening local human resources in science, technology, engineering and mathematics; promoting

[3] For example, in Costa Rica, the national water laboratory set up a contest among villages to design and operate community water systems. By leveraging the designs contributed by villages, as well as lending technical expertise, the laboratory was able to put in place water systems that were suitable for specific local contexts.

the capacity of communities and local business to innovate; and harnessing effective international collaboration in science, technology and innovation fields.

B. Science, technology and innovation as an enabler of the post-2015 development agenda

18. Looking ahead to the role of science, technology and innovation in the post-2015 development agenda, the Commission focused its attention on the use of strategic foresight to anticipate trends in science, technology and innovation and to guide policies that strengthen public research institutions in order to channel research towards relevant areas for sustainable development goals, harness ICT as a tool that enables inclusive development and apply a gender lens to science, technology and innovation policies.

Strategic foresight for the post-2015 development agenda

19. The post-2015 development agenda will include a set of sustainable development goals that build on the Millennium Development Goals and define development priorities through 2030. The agenda promises to be ambitious, encompassing economic transformation, inclusivity and environmental protection. Against that background, the Commission examined the role of strategic foresight in implementing the post-2015 development agenda.[4] It conducted a strategic foresight exercise on key science, technology and innovation trends for sustainable development, including those related to agriculture, energy and the environment (see E/CN.16/2015/3). The Commission concluded that strategic foresight is an important policy tool that can help gather intelligence on future trends and challenges in science, technology and innovation and guide development strategies and plans. For example, strategic foresight can help policymakers identify potential long-term skills gaps in human resources and design appropriate education policies and capacity-building strategies. Furthermore, by involving structured debate among members of the government, academia, industry and civil society, strategic foresight can lead to a shared understanding of long-term issues among development stakeholders.

20. Foresight exercises in Latin America[5] showed that a key challenge in strengthening the value of strategic foresight for the post-2015 development agenda will be to link foresight exercises with decision-making processes. That highlights the need for new institutions in many countries dedicated to foresight within government and non-governmental bodies.

21. Moreover, foresight experiences in Africa[6] highlighted the importance of context-specific foresight methods, continuous resource support for foresight

[4] Strategic foresight is the study and evaluation of future trends and "megatrends" in global development, together with their potential social, environmental and economic impacts. See E/CN.16/2015/3.

[5] The Commission discussed the work of the Inter-American Dialogue, which has registered more than 800 long-term global and sector-specific foresight studies with a focus on Latin America.

[6] For example, the diagnostic and foresight process in South Africa enabled the open, shared confrontation of harsh national realities through an independent, endogenous planning commission. See http://unctad.org/meetings/en/Presentation/ecn162015p07_KaruriSebina_en.pdf.

exercises, suitable communication campaigns to publicize foresight findings, transparency in foresight processes to promote legitimacy and participatory processes to encourage community ownership of foresight exercises.

22. The Commission recommended that governments conduct strategic foresight on global and regional challenges at regular intervals and share the results. In that process, governments are encouraged to make use of existing regional mechanisms and collaborate with relevant stakeholders. The European Foresight Platform and the International Foresight Academy are successful examples of such collaborations.

Role of public research institutions and indigenous innovations

23. Public research institutions have a critical role to play in the post-2015 development agenda, particularly in channelling research efforts to areas relevant for the sustainable development goals. In that regard, the Commission encouraged governments to involve public research institutions more directly in designing and implementing development agendas.[7] That would help embed research related to the post-2015 development agenda into the strategic plans and research of those institutions.

24. Many of the challenges countries will face while implementing the post-2015 development agenda will be specific to local communities. The Commission called for collaboration between research institutions and marginalized communities to bring together academic and local knowledge. It also recommended collaborative projects that promote local needs-based innovation[8] and the scaling up of grass-roots solutions.

Harnessing information and communications technology for inclusive and sustainable development

25. ICT is intricately linked with the three emerging themes of the post-2015 agenda: transformation, inclusivity and sustainability (see E/CN.16/2015/2).

26. The Commission continued to identify emerging technologies that can enhance digital connectivity and promote sustainable rural development, in particular television white space technology and next-generation satellites (see E/CN.16/2015/2). In addition to increasing rural Internet connectivity, those emerging technologies could strengthen environmental monitoring and natural disaster response capabilities. The Commission recommended measures to facilitate the wider application of those technologies, including the development of regulations and licensing mechanisms.

27. The Commission further examined five ICT trends that are transforming the information revolution and considered their implications for policy and regulation: datafication, big data, cloud computing, the Internet of things and smart systems (see E/CN.16/2014/3). The Commission concluded that taking advantage of the opportunities and mitigating the risks of those trends would require developing the

[7] The Institute for Water Technology in Mexico was cited as a successful case study in that context.

[8] The Council for Scientific Research at the University of the Republic in Uruguay, for example, has pioneered the design of programmes that link university researchers effectively with local communities to solve problems.

necessary hard and soft infrastructure, such as ICT infrastructure, human resources and regulatory frameworks.

28. For example, UNCTAD research found that cloud computing and services offer governments, businesses and other organizations opportunities such as reducing the budget for information technology hardware and enhancing data storage reliability and elasticity.[9] However, infrastructure deficiencies, such as low broadband penetration and unreliable power, seriously hamper the uptake of cloud computing in many developing countries. Similar challenges limit the development of e-commerce, reducing its potential to create jobs and enhance firms' participation in global value chains.[10] Further, the cloud poses legal and regulatory challenges, especially concerning data protection and privacy. The Commission called for further systematic research on the new ICT trends and their impact on development to facilitate a better understanding of the opportunities and risks they pose, particularly in the context of the post-2015 development agenda.

29. The Commission continued to monitor as well as highlight the changing nature of digital divide, from one based on access to one based on capabilities. Although growing portions of the populations in developing countries are gaining access to digital technologies, few have the necessary skills to make the transition from ICT users to ICT producers. Hence, the Commission stressed the need for a skills-based approach to ICT capacity-building, so that digital access leads to stronger development results.

30. Finally, the Commission pointed to the need to broaden the ICT-for-development (ICT4D) discourse, which has often translated into a fragmented and isolated approach to policymaking. The Commission recommended a holistic and systemic approach to digital policy formulation, taking into consideration all relevant components[11] of the digital ecosystem. The Commission further encouraged governments to conduct assessments of their national digital ecosystems with a view to identifying gaps and weaknesses. It also drew attention to constraints affecting the deployment of ICT, including limited infrastructure, power and financial and human resources.

Applying a gender lens to science, technology and innovation

31. Science, technology and innovation policies should reflect the different roles women and men play in family and community. To that end, the work of the Commission continued to underscore the importance of integrating a gender perspective into science, technology and innovation.

32. In 2011, the secretariat of the Commission published a report entitled "Applying a gender lens to science, technology and innovation" (available from http://unctad.org/en/Docs/dtlstict2011d5_en.pdf) and identified three entry points:

(a) Science for women: developing science and technology that support women's development and livelihood activities;

[9] *Information Economy Report 2013: The Cloud Economy and Developing Countries* (United Nations publication, Sales No. E.13.II.D.6).

[10] *Information Economy Report 2015: Unlocking the Potential of E-Commerce for Developing Countries* (United Nations publication, Sales No. E.15.II.D.1).

[11] Including, for example, technological infrastructure, data infrastructure, financial infrastructure, institutional infrastructure and human infrastructure.

(b) Women in science: promoting gender equality in education, careers and leadership in science, technology, engineering and mathematics;

(c) Women in innovation: encouraging and supporting the role of women in innovation systems at national and grass-roots levels.

33. As a follow-up to the 2011 publication, the secretariat of the Commission produced a report entitled "Technology in action: good practices in science, technology and innovation policies for women in South Asia" (available from http://unctad.org/en/PublicationsLibrary/dtlstict2013d3_en.pdf). The report highlighted good practices in leveraging science, technology and innovation to help women be more productive and efficient in their daily work, diversify their economic activities and improve their ability to care for their families; in creating opportunities for women in fields related to science, technology, engineering and mathematics; and in strengthening women's capacities as entrepreneurs and supporting their business activities. The cases provide important lessons for formulating more effective science, technology and innovation policies for women.

34. First, when applying a gender lens to science, technology and innovation policies and initiatives, it is essential to link those policies to women's livelihood activities and responsibilities. For example, women's roles as livelihood managers and farmers in many communities means agricultural technologies such as drip irrigation can greatly improve their lives and the well-being of their families and communities. The same is true for science, technology and innovation initiatives that improve water supply and sanitation or introduce electricity in villages; in addition to improving the health of families and communities, such initiatives can reduce the time women in many communities devote each day to collecting water and fetching wood or kerosene.

35. Second, to reap the potential benefits of technological developments, training programmes designed according to the needs of the targeted women are necessary to familiarize them with the technology and demonstrate its inherent benefits. In that context, it is important to pay attention to cultural sensitivities when designing capacity-building activities; for example, the activities could be led by local women.

36. Third, science, technology and innovation policies and initiatives for women should incorporate a community-driven approach and give women an active role in the implementation process. For instance, the Commission found that engaging community leaders in the different stages of a programme helps ensure cultural sensitivity, especially regarding gender issues, and improves the likelihood of success. Similarly, involving the targeted women in decision-making processes or giving them a role in implementation will facilitate their interest and participation.

37. Overall, science, technology and innovation policies for women need to be context specific. That means considering the specific cultural, economic and social factors that contribute to the gender divide in their particular communities. It also means addressing the needs and challenges of the specific roles and responsibilities women play in their particular societies. The Commission recommends that governments and other stakeholders give due consideration to context when scaling up successful policies and initiatives.

Moving forward: articulating the role of science, technology and innovation beyond 2015

38. Based on the findings of its discussion on priority themes at its seventeenth and eighteenth sessions, the Commission recommended four resolutions for adoption by the Economic and Social Council (see E/2014/31-E/CN.16/2014/4 and E/2015/31-E/CN.16/2015/4). In its resolution 2014/28, the Council called upon the Commission to help articulate the important role of ICT and science, technology, innovation and engineering in the post-2015 development agenda by acting as a forum for horizon scanning and strategic planning; providing foresight about critical trends in science, technology and innovation; and drawing attention to emerging and disruptive technologies that can potentially affect the achievement of that agenda. It also called on the Commission to continue its role as a torch-bearer for science, technology and innovation and to provide high-level advice to the Council and the General Assembly on relevant science, technology, engineering and innovation issues.

III. Strengthening science, technology and innovation capacity

39. Lessons from the experience of the Millennium Development Goals underscore the importance of strengthening national science, technology and innovation capacities. To that end, UNCTAD has continued to conduct research, carry out technical assistance and build consensus, including through, inter alia, its science, technology and innovation policy reviews, presented and discussed at the annual sessions of the Commission. In addition, its work has aimed at improving the integration of science, technology and innovation policies within national development strategies; making innovation policies more inclusive; enhancing innovation systems; facilitating technology transfer; promoting technology parks and cooperation in science, technology and innovation; and strengthening ICT capacity.

Integrating science, technology and innovation policies within national development strategies

40. UNCTAD completed science, technology and innovation policy reviews of Oman and Thailand in 2014 and 2015 and presented the results at the seventeenth and eighteenth sessions of the Commission, respectively. Science, technology and innovation policy reviews support national governments in their efforts to integrate science, technology and innovation policies into their national development strategies.

41. One main finding of the reviews was that the scope and quality of interactions between business, academia and government are a major factor in the performance of national innovation systems. Circumstances that discourage interaction include large firms that are reluctant to collaborate with national counterparts, academic research that is not relevant for national industry, overtly protective intellectual property guidelines in academia and low spending on research and development.

42. Another observation was that an absence of a national innovation strategy allows each ministry and related agencies to elaborate science, technology and innovation policies without much cross-consultation and coordination. That can result in poor synergy and implementation. Governments need to establish a clear

division of the roles and responsibilities and hierarchies among science, technology and innovation institutions. For instance, departments responsible for policy setting, departments responsible for financing and departments responsible for implementation should be independent of each other.

43. The reviews also stressed the development of strong national innovation capabilities to ensure sustainable competitiveness and continued increases in productivity and per capita income. Qualitative and quantitative assessments of outcomes that go beyond the traditional metrics of inputs, such as funding for research and development, are necessary for developing evidence-based innovation policies.

44. The review of Oman highlighted several framework conditions[12] related to governance, infrastructure development, business environment, human resources and research capabilities that are particularly relevant for resource-rich economies. First, economic growth based on importing a large percentage of low-cost labour can be a strong disincentive to innovation and technology-based growth. Second, in an economy overly dependent upon natural resource exports, the global competitiveness of national sectors will be at risk as imports become more affordable. Third, the absence of a strong antitrust authority and competition law, and an underdeveloped technical capacity to manage intellectual property, inhibit the development of a dynamic small and medium enterprise sector. Finally, in a society where wealth is accumulated through the extraction of natural resources, citizens may be less inclined to take risks. The result is a strong preference for investing in tangible assets such as real estate, rather than in industry or other high innovation sectors.

45. The review for Thailand provides lessons for middle income economies. First, governments must improve the quality of science, technology and innovation education and training. That includes improving the education budget and holding educational institutions accountable. Budgets should provide sufficient resources for training teachers in science, technology and innovation skills; developing science, technology and innovation training materials; and upgrading equipment. Second, tax incentives for research and development, even when generous, do not attract sufficient private resources into innovation activities. That is in line with the observed contradiction between an increase in technological inputs in developing countries and a widening gap in technological outputs. Such trends show the need for coherence in setting science, technology and innovation policy targets, and for coordination, continuity and effective implementation of those policies in order for research and development expenditures to lead to stronger innovation (see TD/B/C.II/MEM.4/5).

46. A challenge common to many countries is the integration of science, technology and innovation policies into sectoral policies and development plans. One reason is a lack of science, technology and innovation policy awareness among sectoral policymakers. Additional efforts are therefore required to train sectoral policymakers on the role of science, technology and innovation and policy options and instruments, and ways to integrate science, technology and innovation into sectoral policies.

[12] Framework conditions constitute the overall environment in which a national innovation system functions.

47. Further work could be carried out to explore how governments could improve the monitoring and evaluation of science, technology and innovation policies and programmes and strengthen the oversight and accountability of science, technology and innovation institutions; for example, the type of incentives that should be provided to ensure greater accountability and enhanced science, technology and innovation policy learning.

48. Drawing upon the findings of the science, technology and innovation policy reviews, the Commission highlighted the following policy recommendations: developing institutional support for entrepreneurs and risk taking; stimulating research and development, in particular cross-disciplinary research initiatives; strengthening the protection and enforcement of intellectual property rights; bolstering education and vocational training programmes in the fields of science, technology, engineering and mathematics; and increasing the participation of traditionally underrepresented groups in science and technology. Finally, the Commission encouraged governments not to limit science, technology and innovation work to urban centres, as that could foster a technology divide between residents of urban areas and rural areas.

Adopting inclusive innovation policies

49. Given the widening inequalities across the world, innovation policies that encourage technological developments that meet the needs of low-income communities and excluded groups are of paramount importance. That was stressed at the sixth session of the Investment, Enterprise and Development Commission of UNCTAD.

50. The Commission highlighted important considerations for designing and implementing inclusive innovation policies. First, innovation policies need to facilitate collaboration between firms and the other players in the innovation system to encourage the development of products that meet the needs of the poor. In that context, governments can facilitate linkages and partnerships between small grass-roots innovators and larger science, technology and innovation stakeholders to help scale up grass-roots innovations. Second, policies should support the microenterprises that provide the demand-side services and the main intermediaries responsible for the sales and support of small-scale innovations.[13] Third, governments can encourage public-funded research and research and development organizations to do more to meet the needs of the poor. Examples include competitive research grants, prizes and public awards for research that produce relevant innovations, and competitive public sector procurement for the production of specific goods and services for the poor (see TD/B/C.II/25). Finally, institutions and the laws and regulations they create play an important role in determining the extent to which the poor can participate in and benefit from the innovation processes. For instance, laws and regulations governing intellectual property rights may be an obstacle to inclusive innovation.

[13] Empirical work on successful innovations for the bottom-of-the-pyramid market in the mobile sector in Kenya highlighted the importance of regulations and policy initiatives that facilitated the participation of more market players and ensured stronger competition. See TD/B/C.II/25.

Developing international technology and innovation networks

51. The increasing use of open innovation models, which entail the collaboration of firms with external partners to expand and strengthen their competitive advantages through innovation, is not limited to collaboration at the local level. Transnational corporations increasingly locate their activities at different points along the global value chains and rely on innovation created throughout the chain.[14]

52. Global value chains are increasingly present in developing countries and interact with their national innovation systems. For developing countries, the benefits of global value chains will depend on the linkages local firms develop with other agents of the chain, and on their ability to learn and improve through those linkages.

53. Science, technology and innovation policies can contribute to enhancing and strengthening the participation of local firms in global value chains. Policies that could foster the integration or upgrading of local firms or farmers in developing countries include promoting the development of strong sectoral innovation systems in a particular industry; establishing meso-institutions to support firms and farmers (e.g., metrology and standards organizations, industry associations); establishing incubators or clusters; and using public-private partnerships, such as research consortiums, to promote collaboration and knowledge flows.

54. For example, in South Africa a national meso-institution for automotive standards played a major role in meeting international standards, which was key to helping local firms integrate into automotive global value chains and adjust to global integration following the liberalization of the economy in the 1990s. In Kenya, it was possible to integrate smallholder farmers into global value chains by providing support to help them meet international sanitary and phytosanitary standards and traceability requirements, among other challenges.

55. Linkages between local and international innovation agents are not limited to firms but are also present between other innovation agents. For instance, international networks in research involve academics and institutional collaboration agreements between universities and research centres.

56. The increasingly international nature of innovation implies that science, technology and innovation policies need to address both national and local contexts and take into account the need to participate on favourable terms in international technology and innovation networks, such as global value chains. In that context, it is important to recognize the existence of firms with different capacity levels when designing science, technology and innovation policies. Science, technology and innovation policies should strengthen both firms that already have the capacities to participate in international networks and those that participate only in local markets.

Facilitating technology transfer

57. Technology transfer through collaborations and partnerships was a specific theme of UNCTAD Commissions, Multi-year Expert Meetings and Current Studies

[14] The second and third sessions of the Multi-year Expert Meeting on Investment, Innovation and Entrepreneurship for Productive Capacity-Building and Sustainable Development examined global value chains and the internationalization of innovation systems. See TD/B/C.II/MEM.4/5 and TD/B/C.II/MEM.4/6.

publications.[15] Research showed that the link between technology transfer and innovation should not be taken for granted; success in the transfer of technology among countries must be distinguished from success in the application of these technologies to create local innovation. Analysis of the various approaches that firms and industries in different countries have taken highlighted several important lessons.[16]

58. First, local absorptive capacity, including human capital, domestic knowledge accumulation and the basic infrastructure required for research and development, must be strengthened for technology transfer to lead to technological upgrading and local innovation. For instance, empirical work on innovation in Ghana and Kenya showed that firms that had developed internal research and development were capable of identifying and acquiring technology externally and diffusing it internally.

59. Second, the capacity to innovate is not the result of acquiring new technologies alone: it also requires new management, organizational and entrepreneurial skills. Policymakers in developing countries should therefore improve their ability to help actors in the innovation system identify opportunities for innovation in the economy. That could be done by providing information on the type of technologies available, or that will be available, and linking it to business opportunities in the economy.

60. Third, other policy dimensions play a key role in building technological capabilities and accelerating the process of catch-up. They include industrial policies, trade, foreign direct investment, education and training, small and medium enterprises, entrepreneurship and competition policies, and, in particular, intellectual property rights.[17] As the cost of international patent protection is high, further work could be carried out to understand how to move from sole ownership of intellectual property to codevelopment involving joint filing and commercialization.

Promoting science, technology and innovation parks

61. The seventh session of the Investment, Enterprise and Development Commission looked at the role of science, technology and innovation parks in promoting collaboration among the actors in innovation systems and enhancing the international competitiveness of local firms.

62. The Commission highlighted the following key issues (see TD/B/C.II/30). First, government support for different public policy areas, including education, research, industry, small and medium enterprises, trade and taxation, is needed for science, technology and innovation parks to be successful. Second, the commercial aim of the park's financial viability may create tension with the policy goal of stimulating effective collaboration and innovation. Third, the sector profile of the park should be

[15] Including the sixth session of the Investment, Enterprise and Development Commission; the second session of the Multi-year Expert Meeting on Investment, Innovation and Entrepreneurship for Productive Capacity-Building and Sustainable Development; and two Current Studies reports.

[16] See UNCTAD, "Studies in technology transfer: selected cases from Argentina, China, South Africa and Taiwan Province of China". Available from http://unctad.org/en/PublicationsLibrary/dtlstict2013d7_en.pdf.

[17] See UNCTAD, "Transfer of technology and knowledge-sharing for development: science, technology and innovation issues for developing countries". Available from http://unctad.org/en/PublicationsLibrary/dtlstict2013d8_en.pdf.

aligned with the national development and innovation strategies.[18] Finally, the knowledge and technology transfer that can occur may be founded on legal instruments such as intellectual property and non-disclosure agreements; therefore, parks need to be able to provide tenants with intellectual property advice and support.

Promoting international cooperation in science, technology and innovation

63. International cooperation and partnerships between different stakeholders are crucial for strengthening science, technology and innovation capacity, especially in the context of the post-2015 development agenda. The Commission on Science and Technology for Development pointed out that good global governance of research was necessary to overcome the North-South divide on research and science. Member States reported some key benefits and successful initiatives of international cooperation:

(a) Global partnerships have helped scale up innovative science, technology and engineering solutions. Examples include the United States Global Development Lab and the Krabi Initiative of the Committee on Science and Technology of the Association of Southeast Asian Nations;

(b) Global and bilateral science, technology and innovation collaborations have strengthened research and education, including vocational training, in developing countries. Examples include IST-Africa, the South East Asia Research Network, the German-Thai Dual Excellence Education Programme and the Higher Engineering Education Alliance Program between the United States of America and Viet Nam;

(c) International science, technology and innovation cooperation has also supported women's participation in science, technology and innovation in developing countries. For instance, the programme TechWomen, an initiative of the Department of State of the United States, empowers, connects and supports the next generation of women leaders in science, technology, engineering and mathematics in Africa and the Middle East;

(d) Finally, global partnerships have helped create science, technology and innovation parks in developing countries. For example, the development of the Sheda Science and Technology Complex in Nigeria benefited from support from international organizations and public and private sectors in China, France, Germany, Poland and the United States.

Strengthening information and communications technology capacity through technical assistance

64. UNCTAD is actively involved in helping developing countries and economies in transition strengthen their ICT capacity through ICT technical assistance. To help countries build their capacity to measure the information economy, UNCTAD has offered regional training courses and provided tailored, demand-driven assistance to institutions involved in the collection and dissemination of official statistics on the information economy (e.g., national statistical offices).[19] To strengthen the legal and

[18] Indeed, the experience of the European Union suggests that science, technology and innovation parks should support the specific business and innovation strategies of the geographic areas in which they are located.

[19] The programme began in 2007 and 99 countries across different geographic regions have

regulatory framework for e-commerce. UNCTAD has helped policymakers and lawmakers at national and regional levels improve their understanding of the underlying issues of ICT.[20] Assistance includes training courses, the review of draft legislation and regional assessments of the status of cyberlaws.

65. To assist government officials in devising ICT strategies that are consistent with their development goals, UNCTAD published a framework for ICT policy reviews.[21] Likewise, to assess the readiness of countries for e-commerce, the *Information Economy Report 2015: Unlocking the Potential of E-Commerce for Developing Countries*[10] presented the new UNCTAD Business-to-Consumer (B2C) E-commerce Index. The index allows countries to compare their readiness with others and indicates their relative strengths and weaknesses in different aspects of the e-commerce process, such as the quality of Internet structure and the availability of payment and delivery solutions. Furthermore, the report mapped the availability of national legislation in four key areas of cyberlegislation: e-transactions, consumer protection online, data protection and privacy, and cybercrime.

66. The work of UNCTAD in integrating ICT policies into national development strategies highlights the following lessons. First, for ICT to fully contribute to economic and social development, governments must first define the development objectives and then consider how ICT may serve as an enabler.[22] Second, inter-ministerial collaboration is important in order to design relevant and effective ICT-for-development policies. For example, the process of designing e-commerce strategies should involve ministries responsible for justice, finance, science and technology, ICT, trade, rural development, employment, and post and transportation. Governments should also consult relevant stakeholders from the private sector and civil society. Third, monitoring and follow-up mechanisms should be put into place; that may in turn require special efforts to collect data and statistics.

IV. Implementation of World Summit on the Information Society outcomes

67. In accordance with the mandate of the Economic and Social Council and the General Assembly, the Commission on Science and Technology for Development serves as the focal point in the system-wide follow-up to the outcomes of the World Summit on the Information Society. During 2014 and 2015, the Commission's work covered three pillars: (a) reporting on the follow-up to the World Summit outcomes, including a 10-year review of progress made in the implementation of the outcomes of the World Summit; (b) conducting research, particularly on the review of

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benefitted from the initiative.

[20] The UNCTAD E-commerce and Law Reform Programme was created in 2002. Since 2007, programme activities have been implemented in 21 countries in Africa, 10 in Asia and 22 in Latin America and the Caribbean; overall, 20 are least developed countries.

[21] See UNCTAD, "A framework for information and communications technology policy reviews: helping countries leverage ICT for development". Available from http://unctad.org/en/PublicationsLibrary/dtlstict2013d6_en.pdf.

[22] A useful illustration of this point is the mapping of the linkages between the action lines agreed at the World Summit on the Information Society and the sustainable development goals proposed by the Open Working Group on Sustainable Development Goals. The exercise showed that at least one action line can be seen as relevant to the achievement of each of the 17 sustainable development goals.

international public policy issues pertaining to the Internet; and (c) promoting dialogue and building consensus on furthering the implementation of the World Summit outcomes.

68. In 2014 and 2015, the Secretary-General issued annual reports on the progress made in the implementation of and follow-up to the outcomes of the World Summit on the Information Society at the regional and international levels (see A/69/65-E/2014/12 and A/70/63-E/2015/10). The reports contain information provided by entities in the United Nations system, as well as other stakeholders, on their efforts during the previous year to implement the World Summit outcomes, with a view to sharing effective practices and lessons learned.[23]

69. In response to the concerns expressed about the digital divide by the General Assembly in its resolution 68/220, the report of the Secretary-General on activities during 2014 (A/70/63-E/2015/10) emphasizes the importance of investment in broadband networks and services, content and capacity-building for users to be able to make full use of the opportunities provided by ICT; the need to ensure trust in ICT and maintain cybersecurity; the need for legal and regulatory arrangements to adapt to rapidly changing technology and markets, including the growing significance of e-commerce, cloud computing and the Internet of things; the need to resolve differences concerning Internet governance, enabling governments and other stakeholders to carry out their roles and responsibilities in accordance with the World Summit outcomes; and the importance of ensuring that ICT contributes positively towards meeting environmental challenges.

70. At the seventeenth and eighteenth sessions, in the context of the substantial discussion on the 10-year review of the progress made in the implementation of the World Summit outcomes, the Commission discussed the developments and trends related to the World Summit, as requested in paragraphs 8 and 18 of resolution 68/220. They emphasized that, while considerable progress has been made in increasing access to ICT and reducing the digital divide in basic services, there is evidence of continued and, in some cases, growing digital divides in many areas which are of great importance to maximizing the value of ICT for development, including connectivity and affordable access to broadband services. Concern was expressed about the divide between developed and developing countries, the needs of least developed countries, the importance of continuing to address the gender divide and the need to ensure full inclusiveness in the information society, including for economically and socially marginalized groups.

71. In its resolution 2013/9, the Economic and Social Council requested the Commission to collect inputs from all facilitators and stakeholders concerning progress made in the implementation of the World Summit outcomes. The Council also requested the Commission to submit, after its eighteenth session, the results of its 10-year review of progress made in the implementation of the outcomes of the World Summit, through the Council, to the General Assembly as it makes an overall review of the implementation of the outcomes of the World Summit in 2015. To that end, the Commission secretariat set up a multi-stakeholder open consultation process from June to October 2014 to gather insight from all stakeholders, in particular their views and priorities on progress made at the regional and international levels. In addition, seven face-to-face consultations focused on particular regions were organized. The

[23] See A/70/63-E/2015/10, footnote 1, for the list of entities that contributed to that report.

findings were compiled in the form of a report entitled "Implementing WSIS outcomes: a ten-year review" (available from http://unctad.org/en/PublicationsLibrary/dtlstict2015d3_en.pdf). The report served as the basis for the substantive discussion of the Commission on the 10-year review of the progress made in the implementation of the World Summit outcomes.

72. The Commission noted that the World Summit outcome documents continue to provide a solid foundation for shaping the information society, putting the vision of a people-centred, inclusive and development-oriented information society at the heart of the review. They emphasized the importance of mainstreaming ICT into the sustainable development goals and the post-2015 development agenda and called for synergies to be identified between the 10-year review of the World Summit and those processes.

73. In its resolution 67/195 on information and communications technologies for development, the General Assembly invited the Chair of the Commission to establish a working group on enhanced cooperation to examine the mandate of the World Summit on the Information Society regarding enhanced cooperation as contained in the Tunis Agenda. The working group met five times between May 2013 and May 2014. The Chair of the Working Group gave an account of the Working Group's efforts at the seventeenth session of the Commission. At the recommendation of the Economic and Social Council, the work concerned with the review of international public policy issues pertaining to the Internet was continued by the secretariat of the Commission. The Commission reported on the findings of that work at the eighteenth session of the Commission.

74. As the outcome of its 10-year review of the World Summit, the Commission recommended that the Economic and Social Council forward the report of the Commission on its eighteenth session, including a summary of the substantive discussion on the 10-year review of implementation of the World Summit outcomes alongside a link to the interventions made in that regard, to the preparatory process of the high-level meeting of the General Assembly, to be held on 15 and 16 December 2015, that will conclude the review process on the World Summit. The Commission also recommended that the Council submit the report prepared by the its secretariat entitled "Implementing WSIS outcomes: a ten-year review" to the preparatory process of the high-level meeting of the Assembly for their deliberation.

V. Strengthening science-policy advice; integrating science, technology and innovation into financing for development; and enhancing support mechanisms for science, technology and innovation

Strengthening science-policy advice in the United Nations system

75. The Secretary-General announced the creation of a scientific advisory board on 24 September 2013, during the inaugural meeting of the High-level Political Forum on Sustainable Development. The board is made up of 26 eminent scientists, representing natural, social and human sciences and engineering. The board is mandated to provide advice on science, technology and innovation for sustainable development to the Secretary-General and to the executive heads of United Nations system organizations.

76. In response to the mandate of the United Nations Conference on Sustainable Development to contribute to strengthening the science-policy interface for sustainable development (see General Assembly resolutions 66/288, annex, para. 85 (k), and 67/290, para. 20), the 2015 edition of the *Global Sustainable Development Report* of the Department of Economic and Social Affairs of the Secretariat was released at the High-level Political Forum.[24] The report dealt specifically with strengthening the science-policy interface in the context of the post-2015 development agenda. It underscored the critical function of the science-policy interface in identifying new and emerging issues warranting policymakers' attention. The report noted that science-based policymaking is not generally well institutionalized through formal mechanisms in many countries. Therefore, the report called for adapting scientific knowledge to local needs and circumstances by strengthening national scientific institutions and by linking national institutions with global research initiatives and scientific communities and other productive sectors.

Integrating science, technology and innovation into financing for development

77. Science, technology and innovation and related capacity-building are essential to implementing the sustainable development goals and the overall post-2015 development agenda. Similarly, they are essential elements of the Addis Ababa Action Agenda of the third International Conference on Financing for Development.

78. Innovative and affordable technology solutions will have to be developed, transferred and disseminated on an unprecedented scale in order to eradicate poverty and achieve sustainable development at a global scale by 2030. In view of such a challenge, special efforts will be needed to build science, technology and innovation capacity and enabling policy environments and to facilitate technology development, transfer and dissemination for inclusive sustainable development.

79. The United Nations Conference on Sustainable Development called for identifying options for a technology facilitation mechanism (see resolution 66/288, annex). Member States continued discussions on the way forward, in particular in the form of workshops and structured dialogues convened by the President of the General Assembly in 2013 and 2014 as well as other negotiations in the lead-up to the third International Conference on Financing for Development.

80. The outcome document of the third International Conference on Financing for Development (A/CONF.227/20) includes a decision to establish a technology facilitation mechanism, comprising a multi-stakeholder forum on science, technology and innovation for the sustainable development goals; an online platform as a gateway for information on existing science, technology and innovation initiatives, mechanisms and programmes; and a United Nations inter-agency task team on science, technology and innovation for the sustainable development goals, which will promote coordination, coherence, and cooperation on science, technology and innovation within the United Nations system to enhance synergy and efficiency, particularly for capacity-building initiatives. The mechanism would be launched at the United Nations summit for the adoption of the post-2015 development agenda.

[24] For an advance, unedited version of the report, see https://sustainabledevelopment.un.org/content/documents/1758GSDR%202015%20Advance%20Unedited%20Version.pdf.

Enhancing global science, technology and innovation supporting mechanisms

81. The Programme of Action for the Least Developed Countries for the Decade 2011-2020 (the Istanbul Programme of Action) and the Istanbul Declaration, which were adopted in 2011 at the Fourth United Nations Conference on the Least Developed Countries, called for a joint gap and capacity analysis with the aim of establishing a technology bank and a science, technology and innovation supporting mechanism dedicated to the least developed countries (see A/68/217).

82. The General Assembly, in its resolution 68/224 adopted on 20 December 2013, requested the Secretary-General to constitute a high-level panel of experts to carry out a feasibility study, with support from Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States, on the proposed technology bank and science, technology and innovation supporting mechanism.

83. In November 2014, the Secretary-General appointed a high-level panel of experts to advise on the organizational and operational aspects of the proposed technology bank and science, technology and innovation supporting mechanism dedicated to the least developed countries. The panel is expected to submit its report to the Secretary-General for transmission to the General Assembly during its seventieth session.